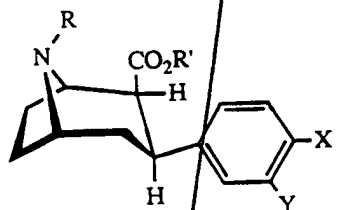


CLAIMS

What is claimed is:

1. An iodinated neuroprobe for mapping monoamine reuptake sites, the iodinated neuroprobe being of the formula:



wherein

R = a C_nH_{2n+1} group where $n=0-6$, an alkenyl group, a monofluoroalkyl group including 19F where $n=18$ or 19 , or a $^{13}C_nH_{2n+1}$ group where $n=1-6$ and where $m=11$ or 14 for at least one ^{13}C ;

R' = a C_nH_{2n+1} group where $n=0-6$, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = an isotope of F, an isotope of Cl, an isotope of Br, an isotope of I, CH_3 , or $Sn(R''_1R''_2R''_3)$;

R''₁ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

R''₂ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

R''₃ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group; and

Y = H only if X is an isotope of I, or R' is a *p*-iodophenylmethyl group, or R' is a *p*-iodophenylethyl group, else Y = an isotope of I.

2. The iodinated neuroprobe of claim 1 wherein the *p*-iodophenylmethyl group incorporates a radioactive isotope of iodine.

CLAIM 1

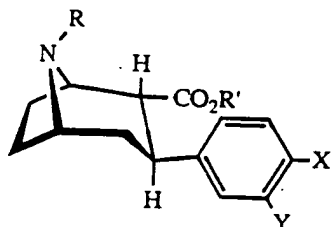
1 3. The iodinated neuroprobe of claim 1 wherein the
2 p-iodophenylethyl group incorporates a radioactive isotope of
3 iodine.

1 24. The iodinated neuroprobe of claim 1 wherein $X = {}^{123}\text{I}$.

1 34. The iodinated neuroprobe of claim 1 wherein $X = {}^{125}\text{I}$.

1 44. The iodinated neuroprobe of claim 1 wherein $X = {}^{131}\text{I}$.

1 7. An iodinated neuroprobe for mapping monoamine reuptake sites,
2 the iodinated neuroprobe being of the formula:



4 wherein

5 $R =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, an alkenyl group, a monofluoroalkyl
6 group including ${}^n\text{F}$ where $n=18$ or 19 , or a ${}^m\text{C}_n\text{H}_{2n+1}$ group where
7 $n=1-6$ and where $m=11$ or 14 for at least one ${}^m\text{C}$;

8 $R' =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, a p-iodophenylmethyl group, a
9 p-iodophenylethyl group, a phenylmethyl group, or a
10 phenylethyl group;

11 $X =$ an isotope of F, an isotope of Cl, an isotope of Br, an
12 isotope of I, CH_3 , or $\text{Sn}(\text{R}''_1\text{R}''_2\text{R}''_3)$;

13 $\text{R}''_1 =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group;

14 $\text{R}''_2 =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group;

15 $R''_3 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group; and
16 $Y = H$ only if X is an isotope of I , or R' is a p -iodophenylmethyl
17 group, or R' is a p -iodophenylethyl group, else $Y =$ an isotope
18 of I .

1 8. The iodinated neuroprobe of claim 7 wherein the
2 p -iodophenylmethyl group incorporates a radioactive isotope of
3 iodine.

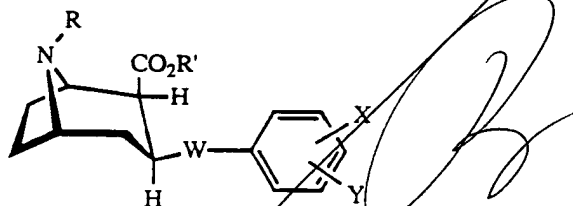
1 9. The iodinated neuroprobe of claim 7 wherein the
2 p -iodophenylethyl group incorporates a radioactive isotope of
3 iodine.

1 ~~610~~. The iodinated neuroprobe of claim ~~7~~⁵ wherein $X = {}^{123}I$.

1 ~~711~~. The iodinated neuroprobe of claim ~~7~~⁵ wherein $X = {}^{125}I$.

1 ~~812~~. The iodinated neuroprobe of claim ~~7~~⁵ wherein $X = {}^{131}I$.

1 13. An iodinated neuroprobe for mapping monoamine reuptake sites,
2 the iodinated neuroprobe being of the formula:



wherein

5 R = a C_nH_{2n+1} group where $n=0-6$, an alkenyl group, a monofluoroalkyl
6 group including mF where $n=18$ or 19 , or a $^mC_nH_{2n+1}$ group where
7 $n=1-6$ and where $m=11$ or 14 for at least one mC ;

8 $R' =$ a C_nH_{2n+1} group where $n=0-6$, a *p*-iodophenylmethyl group, a
9 *p*-iodophenylethyl group, a phenylmethyl group, or a
10 phenylethyl group;

11 X = an isotope of F, an isotope of Cl, an isotope of Br, an
12 isotope of I, CH_3 , or $Sn(R''_1R''_2R''_3)$;

13 $R''_1 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

14 $R''_2 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

15 $R''_3 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

16 Y = H only if X is an isotope of I, or R' is a *p*-iodophenylmethyl
17 group, or R' is a *p*-iodophenylethyl group, else Y = an isotope
18 of I; and

19 W = O, S, $(CH_2)_n$, $O(CH_2)_n$ where $n=1-6$,

20 wherein X resides on a benzene ring of the formula at an
21 ortho, meta, or para position with respect to W, and Y resides at
22 any remaining position on the benzene ring.

1 14. The iodinated neuroprobe of claim 13 wherein the
2 *p*-iodophenylmethyl group incorporates a radioactive isotope of
3 iodine.

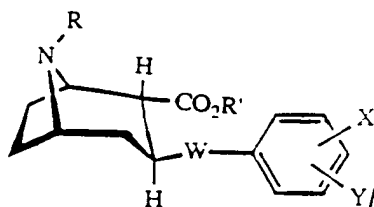
1 15. The iodinated neuroprobe of claim 13 wherein the
2 *p*-iodophenylethyl group incorporates a radioactive isotope of
3 iodine.

1 16. The iodinated neuroprobe of claim 13 wherein $X = {}^{123}\text{I}$.

1 17. The iodinated neuroprobe of claim 13 wherein $X = {}^{125}\text{I}$.

1 18. The iodinated neuroprobe of claim 13 wherein $X = {}^{131}\text{I}$.

1 19. An iodinated neuroprobe for mapping monoamine reuptake sites,
2 the iodinated neuroprobe being of the formula:



4 wherein

5 $\text{R} =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, an alkenyl group, a monofluoroalkyl
6 group including ${}^n\text{F}$ where $n=18$ or 19 , or a ${}^m\text{C}_n\text{H}_{2n+1}$ group where
7 $n=1-6$ and where $m=11$ or 14 for at least one ${}^m\text{C}$;

8 $\text{R}' =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, a *p*-iodophenylmethyl group, a
9 *p*-iodophenylethyl group, a phenylmethyl group, or a
10 phenylethyl group;

11 $\text{X} =$ an isotope of F, an isotope of Cl, an isotope of Br, an
12 isotope of I, CH_3 , or $\text{Sn}(\text{R}''_1\text{R}''_2\text{R}''_3)$;

13 $\text{R}''_1 =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group;

14 $\text{R}''_2 =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group;

15 $\text{R}''_3 =$ a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group;

16 $\text{Y} =$ H only if X is an isotope of I, or R' is a *p*-iodophenylmethyl
17 group, or R' is a *p*-iodophenylethyl group, else $\text{Y} =$ an isotope
18 of I; and

19 W = O, S, (CH₂)_n, O(CH₂)_n where n=1-6,

20 wherein X resides on a benzene ring of the formula at an
21 ortho, meta, or para position with respect to W, and Y resides at
22 any remaining position on the benzene ring.

1 20. The iodinated neuroprobe of claim 19 wherein the
2 p-iodophenylmethyl group incorporates a radioactive isotope of
3 iodine.

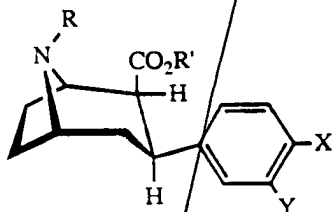
1 21. The iodinated neuroprobe of claim 19 wherein the
2 p-iodophenylethyl group incorporates a radioactive isotope of
3 iodine.

1 22. The iodinated neuroprobe of claim 19 wherein X = ¹²³I.

1 23. The iodinated neuroprobe of claim 19 wherein X = ¹²⁵I.

1 24. The iodinated neuroprobe of claim 19 wherein X = ¹³¹I.

1 25. A precursor of a radiolabled neuroprobe for mapping monoamine
2 reuptake sites, the precursor being of the formula:



4 wherein

5 R = a C_nH_{2n+1} group where $n=0-6$, an alkenyl group, or a
6 monofluoroalkyl group;

7 R' = a C_nH_{2n+1} group where $n=0-6$, a *p*-iodophenylmethyl group, a
8 *p*-iodophenylethyl group, a phenylmethyl group, or a
9 phenylethyl group;

10 X = F, Cl, Br, I, CH_3 , or $Sn(R''_1R''_2R''_3)$;

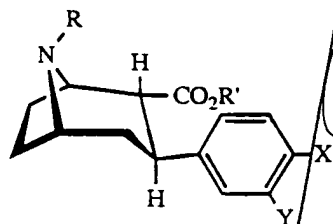
11 R''₁ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

12 R''₂ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

13 R''₃ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group; and

14 Y = H only if X is I, or R' is a *p*-iodophenylmethyl group, or R'
15 is a *p*-iodophenylethyl group, else Y = I.

1 26. A precursor of a radiolabeled neuroprobe for mapping monoamine
2 reuptake sites, the precursor being of the formula:



4 wherein

5 R = a C_nH_{2n+1} group where $n=0-6$, an alkenyl group, or a
6 monofluoroalkyl group;

7 R' = a C_nH_{2n+1} group where $n=0-6$, a *p*-iodophenylmethyl group, a
8 *p*-iodophenylethyl group, a phenylmethyl group, or a
9 phenylethyl group;

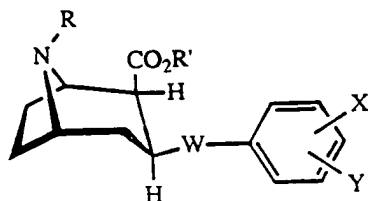
10 X = F, Cl, Br, I, CH_3 , or $Sn(R''_1R''_2R''_3)$;

11 R''₁ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

12 R''₂ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

13 $R''_3 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group; and
 14 $Y =$ H only if X is I, or R' is a *p*-iodophenylmethyl group, or R'
 15 is a *p*-iodophenylethyl group, else $Y = I$.

1 27. A precursor of a radiolabeled neuroprobe for mapping monoamine
 2 reuptake sites, the precursor being of the formula:



4 wherein

5 $R =$ a C_nH_{2n+1} group where $n=0-6$, an alkenyl group, or a
 6 monofluoroalkyl group;

7 $R' =$ a C_nH_{2n+1} group where $n=0-6$, a *p*-iodophenylmethyl group, a
 8 *p*-iodophenylethyl group, a phenylmethyl group, or a
 9 phenylethyl group;

10 $X =$ F, Cl, Br, I, CH_3 , or $Sn(R''_1R''_2R''_3)$;

11 $R''_1 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

12 $R''_2 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

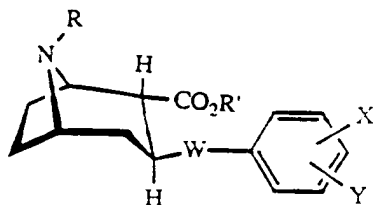
13 $R''_3 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

14 $Y =$ H only if X is I, or R' is a *p*-iodophenylmethyl group, or R'
 15 is a *p*-iodophenylethyl group, else $Y = I$; and

16 $W =$ O, S, $(CH_2)_n$, $O(CH_2)_n$ where $n=1-6$,

17 wherein X resides on a benzene ring of the formula at an
 18 ortho, meta, or para position with respect to W, and Y resides at
 19 any remaining position on the benzene ring.

28. A precursor of a radiolabeled neuroprobe for mapping monoamine reuptake sites, the precursor being of the formula:



wherein

R = a C_nH_{2n+1} group where $n=0-6$, an alkenyl group, or a monofluoroalkyl group;

R' = a C_nH_{2n+1} group where $n=0-6$, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH₃, or Sn(R''₁R''₂R''₃);

R''₁ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

R''₂ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

R''₃ = a C_nH_{2n+1} group where $n=1-6$, or an aryl group;

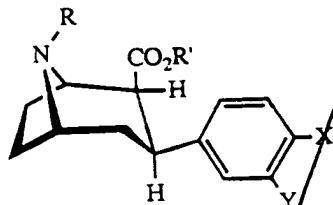
Y = H only if X is I, or R' is a *p*-iodophenylmethyl group, or R' is a *p*-iodophenylethyl group, else Y = I; and

W = O, S, (CH₂)_n, O(CH₂)_n where $n=1-6$,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring.

29. A kit for preparing an iodinated neuroprobe for mapping monoamine reuptake sites, the kit comprising:

a precursor of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R' = a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH₃, or Sn(R''₁R''₂R''₃);

R''₁ = a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''₂ = a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''₃ = a C_nH_{2n+1} group where n=1-6, or an aryl group; and

Y = H only if X is I, or R' is a *p*-iodophenylmethyl group, or R' is a *p*-iodophenylethyl group, else Y = I; and
an oxidizing agent,

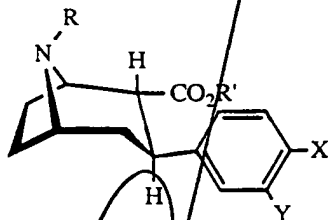
wherein the precursor and the oxidizing agent are to be reacted in the presence of a radioisotope source.

30. The kit of claim 29 wherein the radioisotope source is a solution of a salt of a radioactive isotope of iodine.

31. The kit of claim 29 wherein the radioisotope source is a reagent containing $^{18}\text{F}\text{C}_n\text{H}_{2n+1}\text{X}$ where $n=0-6$ and X is a leaving group.

32. The kit of claim 29 wherein the radioisotope source is a reagent containing ^{18}F of the formula $\text{FC}_n\text{H}_{2n}\text{X}$ where $n=0-6$ and X is a leaving group.

33. A kit for preparing an iodinated neuroprobe for mapping monoamine reuptake sites, the kit comprising:
a precursor of the formula:



wherein

R = a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, an alkenyl group, or a monofluoroalkyl group;

R' = a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3 , or $\text{Sn}(\text{R}''_1\text{R}''_2\text{R}''_3)$;

R''_1 = a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group;

R''_2 = a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group;

R''_3 = a $\text{C}_n\text{H}_{2n+1}$ group where $n=1-6$, or an aryl group; and

Y = H only if X is I, or R' is a *p*-iodophenylmethyl group, or R' is a *p*-iodophenylethyl group, else Y = I; and
an oxidizing agent,

18 wherein the precursor and the oxidizing agent are to be
19 reacted in the presence of a radioisotope source.

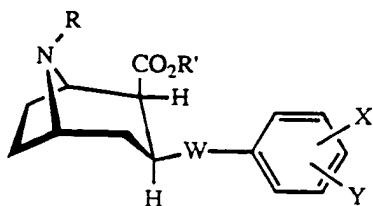
1 34. The kit of claim 33 wherein the radioisotope source is a
2 solution of a salt of a radioactive isotope of iodine.

1 35. The kit of claim 33 wherein the radioisotope source is a
2 reagent containing $^m\text{C}_n\text{H}_{2n+1}\text{X}$ where $n=0-6$ and X is a leaving group.

~~Sub A7~~
1 36. The kit of claim 33 wherein the radioisotope source is a
2 reagent containing ^{18}F of the formula $\text{FC}_n\text{H}_{2n}\text{X}$ where $n=0-6$ and X is a
3 leaving group.

1 37. A kit for preparing an iodinated neuroprobe for mapping
2 monoamine reuptake sites, the kit comprising:

3 a precursor of the formula:



5 wherein

6 R = a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, an alkenyl group, or a
7 monofluoroalkyl group;

8 R' = a $\text{C}_n\text{H}_{2n+1}$ group where $n=0-6$, a p-iodophenylmethyl group, a
9 p-iodophenylethyl group, a phenylmethyl group, or a
10 phenylethyl group;

11 X = F, Cl, Br, I, CH₃, or $\text{Sn}(\text{R}''_1\text{R}''_2\text{R}''_3)$;

12 $R''_1 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;
13 $R''_2 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;
14 $R''_3 =$ a C_nH_{2n+1} group where $n=1-6$, or an aryl group;
15 $Y =$ H only if X is I, or R' is a *p*-iodophenylmethyl group, or R'
16 is a *p*-iodophenylethyl group, else $Y =$ I; and
17 $W =$ O, S, $(CH_2)_n$, $O(CH_2)_n$ where $n=1-6$,
18 wherein X resides on a benzene ring of the formula at an
19 ortho, meta, or para position with respect to W, and Y resides at
20 any remaining position on the benzene ring; and
21 an oxidizing agent,
22 wherein the precursor and the oxidizing agent are to be
23 reacted in the presence of a radioisotope source.

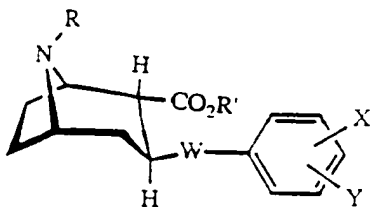
1 38. The kit of claim 37 wherein the radioisotope source is a
2 solution of a salt of a radioactive isotope of iodine.

1 39. The kit of claim 37 wherein the radioisotope source is a
2 reagent containing ${}^mC_nH_{2n+1}X$ where $n=0-6$ and X is a leaving group.

1 40. The kit of claim 37 wherein the radioisotope source is a
2 reagent containing ${}^{18}F$ of the formula $FC_nH_{2n}X$ where $n=0-6$ and X is a
3 leaving group.

41. A kit for preparing an iodinated neuroprobe for mapping monoamine reuptake sites, the kit comprising:

a precursor of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R' = a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH₃, or Sn(R''₁R''₂R''₃);

R''₁ = a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''₂ = a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''₃ = a C_nH_{2n+1} group where n=1-6, or an aryl group;

Y = H only if X is I, or R' is a *p*-iodophenylmethyl group, or R' is a *p*-iodophenylethyl group, else Y = I; and

W = O, S, (CH₂)_n, O(CH₂)_n where n=1-6,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring; and

an oxidizing agent,

wherein the precursor and the oxidizing agent are to be reacted in the presence of a radioisotope source.

1 42. The kit of claim 41 wherein the radioisotope source is a
2 solution of a salt of a radioactive isotope of iodine.

1 43. The kit of claim 41 wherein the radioisotope source is a
2 reagent containing ${}^m\text{C}_n\text{H}_{2n+1}\text{X}$ where $n=0-6$ and X is a leaving group.

1 44. The kit of claim 41 wherein the radioisotope source is a
2 reagent containing ${}^{18}\text{F}$ of the formula $\text{FC}_n\text{H}_{2n}\text{X}$ where $n=0-6$ and X is a
3 leaving group.

1 45. The kit of claim 29, 33, 37, or 41 wherein the oxidizing agent
2 is selected from the group consisting of perchloric acid, performic
3 acid, peracetic acid, hydrogen peroxide, hydrogen peroxide with
4 lactoperoxidase, 1,3,4,6-tetrachloro-3 α ,6 α -diphenylglycouril, and
5 N-chloro-4-methylbenzenesulfonamide sodium salt.